

distance of the star from the limb of *Venus* amounts to about 9'', or half the horizontal parallax, *Venus* being south of the star.

It is practically certain that for a great part of the South Pacific the star will be occulted by *Venus* after sunset; and at some of the antipodean observatories, though there the Sun will not have set, there may be a good chance of obtaining observations of the phenomenon.

Ephemeris for Physical Observations of the Moon for the Second Half of 1900. By A. C. D. Crommelin.

Greenwich Midnight.	Selenographical		Geocentric Libration		Combined Amount.	Direc- tion.
	Colong. of the Sun.	Lat.	Sel. Long. of the Earth.	Lat.		
1900. July 1	325°64	-0°72	+1°54	+6°74	6°91	347°1
2	337°87	-0°75	+0°34	+6°69	6°70	357°1
3	350°11	-0°77	-0°92	+6°35	6°42	8°2
4	2°33	-0°79	-2°20	+5°73	6°14	21°0
5	14°55	-0°81	-3°39	+4°87	5°93	34°8
6	26°77	-0°84	-4°45	+3°77	5°83	49°7
7	38°98	-0°86	-5°26	+2°48	5°82	64°8
8	51°18	-0°88	-5°78	+1°04	5°87	79°8
9	63°37	-0°91	-5°95	-0°48	5°97	94°6
10	75°57	-0°94	-5°72	-2°03	6°07	109°5
11	87°76	-0°96	-5°11	-3°49	6°19	124°3
12	99°95	-0°98	-4°14	-4°78	6°32	139°1
13	112°14	-1°01	-2°88	-5°78	6°46	153°5
14	124°33	-1°03	-1°45	-6°42	6°58	167°3
15	136°52	-1°05	+0°04	-6°64	6°64	180°3
16	148°73	-1°07	+1°47	-6°44	6°61	192°9
17	160°93	-1°09	+2°74	-5°82	6°43	205°2
18	173°14	-1°10	+3°78	-4°85	6°15	217°9
19	185°36	-1°12	+4°58	-3°60	5°83	231°8
20	197°59	-1°13	+5°11	-2°16	5°55	247°1
21	209°83	-1°15	+5°40	-0°63	5°42	263°3
22	222°07	-1°16	+5°46	+0°91	5°54	279°5
23	234°32	-1°18	+5°32	+2°38	5°83	294°1
24	246°57	-1°19	+4°97	+3°71	6°20	306°7
25	258°82	-1°20	+4°50	+4°83	6°60	317°0
26	271°07	-1°22	+3°82	+5°70	6°86	326°2
27	283°32	-1°23	+2°98	+6°29	6°96	334°7
28	295°57	-1°24	+1°99	+6°59	6°88	343°2

Greenwich Midnight.	Selenographical		Geocentric Libration		Combined Amount.	Direc- tion.
	Colong. of the Sun.	Lat.	Sel. Long. of the Earth.	Lat.		
1900.						
July 29	307°81	—1°26	+0°85	+6°59	6°64	352°7
30	320°05	—1°27	—0°39	+6°31	6°32	3°5
31	332°29	—1°28	—1°70	+5°75	6°00	16°5
Aug. 1	344°52	—1°30	—3°01	+4°95	5°79	31°3
2	356°74	—1°31	—4°26	+3°94	5°80	47°2
3	8°96	—1°33	—5°36	+2°73	6°01	63°0
4	21°18	—1°34	—6°22	+1°37	6°36	77°6
5	33°38	—1°36	—6°76	—0°08	6°76	90°7
6	45°58	—1°37	—6°90	—1°48	7°06	102°1
7	57°78	—1°39	—6°58	—3°03	7°24	114°7
8	69°97	—1°40	—5°78	—4°35	7°23	127°0
9	82°15	—1°41	—4°53	—5°43	7°07	140°2
10	94°33	—1°42	—2°91	—6°18	6°83	154°8
11	106°51	—1°43	—1°07	—6°52	6°61	170°7
12	118°69	—1°44	+0°83	—6°40	6°45	187°4
13	130°87	—1°45	+2°62	—5°85	6°41	204°1
14	143°06	—1°45	+4°16	—4°92	6°44	220°2
15	155°26	—1°46	+5°36	—3°69	6°51	235°5
16	167°47	—1°46	+6°18	—2°26	6°58	249°9
17	179°68	—1°47	+6°62	—0°74	6°66	263°6
18	191°90	—1°47	+6°74	+0°80	6°79	276°8
19	204°13	—1°47	+6°56	+2°25	6°94	288°9
20	216°36	—1°47	+6°16	+3°56	7°12	300°0
21	228°59	—1°47	+5°56	+4°68	7°27	310°1
22	240°83	—1°47	+4°79	+5°56	7°34	319°3
23	253°07	—1°48	+3°90	+6°17	7°30	327°7
24	265°31	—1°48	+2°88	+6°49	7°10	336°1
25	277°55	—1°48	+1°76	+6°52	6°75	344°9
26	289°79	—1°48	+0°54	+6°27	6°29	355°1
27	302°02	—1°49	—0°76	+5°74	5°79	7°5
28	314°25	—1°49	—2°11	+4°97	5°40	23°0
29	326°48	—1°49	—3°45	+3°99	5°27	40°8
30	338°71	—1°49	—4°73	+2°82	5°51	59°2
31	350°93	—1°49	—5°87	+1°52	6°06	75°5
Sept. 1	3°14	—1°50	—6°79	+0°12	6°79	89°0
2	15°35	—1°50	—7°30	—1°32	7°42	100°3
3	27°54	—1°50	—7°50	—2°74	7°98	110°1
4	39°74	—1°50	—7°32	—4°05	8°37	119°0

Greenwich Midnight. 1900.	Selenographical Colong. Lat. of the Sun.		Geocentric Libration Sel. Long. Lat. of the Earth.		Combined Amount.	Direc- tion.
Sept. 5	51°92	-1°50	-6°53	-5°17	8°33	128°4
6	64°10	-1°50	-5°23	-6°00	7°96	138°9
7	76°27	-1°49	-3°49	-6°45	7°33	151°6
8	88°44	-1°49	-1°45	-6°46	6°62	167°3
9	100°61	-1°48	+0°70	-6°01	6°05	186°6
10	112°77	-1°47	+2°77	-5°13	5°83	208°4
11	124°94	-1°47	+4°59	-3°91	6°03	229°6
12	137°12	-1°46	+6°02	-2°45	6°50	247°9
13	149°31	-1°45	+7°00	-0°88	7°06	262°8
14	161°49	-1°44	+7°54	+0°70	7°57	275°3
15	173°69	-1°43	+7°66	+2°19	7°97	286°0
16	185°90	-1°41	+7°43	+3°54	8°23	295°5
17	198°10	-1°40	+6°90	+4°67	8°33	304°1
18	210°32	-1°39	+6°15	+5°56	8°29	312°1
19	222°53	-1°38	+5°22	+6°18	8°09	319°8
20	234°76	-1°37	+4°16	+6°52	7°72	327°5
21	246°98	-1°36	+3°00	+6°57	7°22	335°5
22	259°20	-1°35	+1°76	+6°32	6°46	344°4
23	271°43	-1°34	+0°47	+5°82	5°84	355°4
24	283°66	-1°33	-0°86	+5°06	5°13	9°6
25	295°88	-1°32	-2°19	+4°07	4°62	28°3
26	308°10	-1°31	-3°50	+2°91	4°55	50°3
27	320°32	-1°30	-4°74	+1°61	5°01	71°2
28	332°53	-1°29	-5°85	+0°22	5°85	87°8
29	344°74	-1°28	-6°75	-1°20	6°86	100°1
30	356°94	-1°27	-7°38	-2°60	7°82	109°4
Oct. 1	9°13	-1°25	-7°74	-3°90	8°67	116°7
2	21°32	-1°24	-7°46	-5°03	9°00	124°0
3	33°50	-1°23	-6°81	-5°92	9°02	131°0
4	45°67	-1°21	-5°66	-6°46	8°59	138°8
5	57°83	-1°19	-4°06	-6°61	7°76	148°4
6	69°99	-1°18	-2°12	-6°30	6°65	161°4
7	82°14	-1°16	+0°01	-5°55	5°55	180°1
8	94°29	-1°14	+2°13	-4°39	4°88	205°9
9	106°44	-1°11	+4°06	-2°93	5°01	234°2
10	118°60	-1°09	+5°66	-1°30	5°81	257°1
11	130°76	-1°07	+6°84	+0°37	6°85	273°1
12	142°93	-1°04	+7°55	+1°97	7°80	284°6

Greenwich Midnight.	Selenographical Colong. of the Sun.	Lat. of the Sun.	Geocentric Libration Sel. Long.	Lat. of the Earth.	Combined Amount.	Direc- tion.
1900. Oct. 13	155°10	-1°02	+7°81	+3°41	8°52	293°6
14	167°28	-1°00	+7°66	+4°63	8°95	301°2
15	179°46	-0°97	+7°16	+5°59	9°08	308°0
16	191°65	-0°95	+6°38	+6°26	8°94	314°5
17	203°85	-0°93	+5°38	+6°63	8°54	320°9
18	216°05	-0°91	+4°24	+6°71	7°94	327°7
19	228°25	-0°89	+2°99	+6°50	7°15	335°3
20	240°46	-0°87	+1°69	+6°01	6°24	344°3
21	252°67	-0°85	+0°37	+5°26	5°27	356°0
22	264°89	-0°83	-0°94	+4°29	4°39	12°4
23	277°09	-0°81	-2°21	+3°12	3°82	35°3
24	289°30	-0°79	-3°40	+1°81	3°85	62°0
25	301°50	-0°77	-4°49	+0°40	4°51	84°9
26	313°70	-0°75	-5°43	-1°05	5°53	100°9
27	325°91	-0°73	-6°17	-2°47	6°65	111°8
28	338°10	-0°71	-6°68	-3°79	7°68	119°6
29	350°29	-0°68	-6°88	-4°95	8°48	125°7
30	2°47	-0°66	-6°73	-5°88	8°94	131°1
31	14°64	-0°64	-6°20	-6°50	8°98	136°4
Nov. 1	26°81	-0°61	-5°27	-6°75	8°56	142°0
2	38°96	-0°58	-3°96	-6°58	7°68	149°0
3	51°11	-0°56	-2°36	-5°98	6°43	158°5
4	63°26	-0°53	-0°55	-4°97	5°00	173°7
5	75°40	-0°50	+1°31	-3°61	3°84	199°9
6	87°53	-0°47	+3°09	-2°00	3°68	237°1
7	99°67	-0°44	+4°65	-0°27	4°66	266°7
8	111°81	-0°41	+5°88	+1°43	6°05	283°7
9	123°95	-0°37	+6°71	+3°01	7°35	294°2
10	136°10	-0°34	+7°11	+4°36	8°34	301°5
11	148°26	-0°31	+7°10	+5°44	8°94	307°5
12	160°42	-0°28	+6°72	+6°22	9°16	312°8
13	172°58	-0°25	+6°00	+6°68	8°98	318°1
14	184°76	-0°23	+5°03	+6°83	8°48	323°6
15	196°94	-0°20	+3°88	+6°68	7°72	329°9
16	209°12	-0°17	+2°60	+6°24	6°76	337°4
17	221°31	-0°15	+1°27	+5°54	5°68	347°1
18	233°49	-0°12	-0°05	+4°60	4°60	0°6
19	245°69	-0°10	-1°32	+3°46	3°70	20°9

Greenwich Midnight.	Selenographical		Geocentric Libration		Combined Amount.	Direc- tion.
	Colong. of the Sun.	Lat.	Sel. Long. of the Earth.	Lat.		
1900.						
Nov. 20	257°88	-0°07	-2°47	+2°16	3°28	08°8
21	270°07	-0°05	-3°49	+0°74	3°57	78°0
22	282°27	-0°02	-4°34	-0°74	4°40	99°7
23	294°47	0°00	-4°99	-2°20	5°45	113°8
24	306°66	+0°03	-5°42	-3°57	6°49	123°4
25	318°85	+0°05	-5°62	-4°78	7°38	130°4
26	331°04	+0°08	-5°57	-5°76	8°01	136°0
27	343°21	+0°10	-5°26	-6°44	8°32	140°8
28	355°38	+0°13	-4°70	-6°77	8°24	145°2
29	7°55	+0°16	-3°89	-6°71	7°76	149°9
30	19°71	+0°19	-2°85	-6°24	6°86	155°5
Dec. 1	31°85	+0°22	-1°63	-5°37	5°61	163°1
2	44°00	+0°25	-0°28	-4°16	4°17	176°1
3	56°13	+0°28	+1°12	-2°66	2°89	202°8
4	68°26	+0°31	+2°48	-1°00	2°67	248°0
5	80°39	+0°35	+3°73	+0°72	3°80	280°9
6	92°51	+0°38	+4°76	+2°37	5°32	296°5
7	104°64	+0°41	+5°51	+3°84	6°72	304°9
8	116°77	+0°44	+5°93	+5°05	7°79	310°4
9	128°91	+0°47	+5°98	+5°96	8°44	314°9
10	141°05	+0°50	+5°68	+6°55	8°67	319°1
11	153°20	+0°53	+5°05	-6°80	8°47	323°4
12	165°35	+0°55	+4°13	-6°73	7°90	328°5
13	177°51	+0°58	+3°00	-6°37	7°04	334°8
14	189°67	+0°61	+1°72	+5°74	5°99	343°3
15	201°84	+0°63	+0°38	+4°87	4°89	355°5
16	214°01	+0°65	-0°94	+3°79	3°90	13°9
17	226°19	+0°68	-2°17	+2°54	3°35	40°5
18	238°37	+0°70	-3°24	+1°15	3°44	70°5
19	250°56	+0°72	-4°09	-0°30	4°10	94°2
20	262°74	+0°74	-4°68	-1°78	5°01	110°8
21	274°93	+0°76	-4°99	-3°18	5°92	122°5
22	287°12	+0°78	-5°01	-4°45	6°70	131°6
23	299°31	+0°80	-4°77	-5°50	7°28	139°1
24	311°49	+0°83	-4°28	-6°25	7°57	145°6
25	323°68	+0°85	-3°61	-6°65	7°57	151°5
26	335°85	+0°87	-2°79	-6°66	7°22	157°3
27	348°02	+0°90	-1°88	-6°27	6°55	163°3

Greenwich Midnight.	Selenographical Colong. of the Sun.	Lat.	Geocentric Libration Sel. Long. of the Earth.	Lat.	Combined Amount.	Direc- tion.
1900. Dec. 28	0°18	+0°92	-0°92	-5°50	5°58	170°5
29	12°34	+0°94	+0°05	-4°39	4°39	180°7
30	24°48	+0°97	+1°02	-3°01	3°18	198°7
31	36°62	+0°99	+1°95	-1°45	2°43	233°4
1901. Jan. 1	48°76	+1°02	+2°82	+0°19	2°83	273°9

The longitudes are reckoned in the plane of the Moon's equator, the axis of reference being the radius which passes through the mean centre of the visible disc. This axis therefore rotates with the Moon, and is not fixed in space.

The inclination of the Moon's equator to the ecliptic is taken as $1^{\circ}523$, the value used in the *Connaissance des Temps*, that given by the *Nautical Almanac* being $1^{\circ}536$.

The physical librations in longitude and latitude, as given by Professor Franz's formulæ, have been applied; their values are taken from the *Berliner Jahrbuch* for the days given there, and interpolated by a graphical method for the other days. But the signs in the *Jahrbuch* require to be reversed in order to reduce to the system used here.

The colongitude of the Sun is 90° (or 450°) minus his selenographical longitude. It also is the selenographical longitude of the morning terminator reckoned eastward from the mean centre of the disc. Hence its value is approximately 270° , 0° , 90° , 180° at new Moon, first quarter, full Moon, last quarter respectively. The longitude of the evening terminator is of course 180° greater or less than that of the morning one.

When the geocentric libration in longitude is positive, the region brought into view is on the west limb; when negative, on the east.

When the geocentric libration in latitude is positive, the region brought into view is at the Moon's north pole; when negative, at the south.

The column "Combined Amount" gives the distance between the apparent and mean centres of the disc, and the column "Direction" gives the position-angle of the apparent centre from the mean centre, or, which is the same thing, the position-angle of the region which is most carried into view by libration. The angles are reckoned eastward from the northern extremity of the Moon's axis.

The terms "East" and "West" are used throughout with reference to our sky, and not as they would appear to an observer on the Moon.

Benvenue, 55 Ulundi Road, Blackheath, S.E.
1900 February 13.